Temperature Record

Official weather observations in Death Valley have always been taken by volunteer weather observers for the National Weather Service since the beginning of records. Official weather records for Death Valley are considered to be observation day records as the data is not collected at the end of each calendar day. In a system where observation day is used to keep on a record, readings of temperatures are made officially once a day generally at a designated observing time determined as part of the agreement between the observer and the National Weather Service. Data collected each day has typically consisted of a high temperature and low temperature for a twenty four period ending at the time of observation as well as the temperature at the time of observation.

This time of observation has changed though over the years. From 1911 through May 31, 1981 (except from May 1, 1955 through March 10, 1956 and June 1, 1956 through August 31, 1957 when observations were taken between 0700 and 0800 local time), daily observations always took place between 1600 and 1900 local time. During this time period, the majority of the high temperatures are likely from the day the observation was taken on. Since June 1, 1981, observations have been taken at 0800 LST/LDT. Thus, with observations taken at 0800 LST/LDT, the high temperature typically is for the preceding day from that on which it was reported and the low temperature likely would have occurred on the morning the observation was taken.

Temperature records in Death Valley used in this report were made with maximum-minimum liquid in glass thermometers housed in a white painted cotton region shelter that meets National Weather Service observing standards. One thermometer is used to record the highest temperature in the last 24 hours while the other the lowest. They are then reset manually by the observer after collecting their observation.

The Approach To Construct A More Accurate Temperature Record

In order to better represent a set of weather records by calendar day the author assumed that in each case the high and low temperature in the official NOAA's National Centers for Environmental Information (NCEI) datasets was for a calendar day. The official NOAA's National Centers for Environmental Information (NCEI) dataset consists of a set of records that uses observation day for the entire period. The dataset used for this study thus time shifted the high temperatures in NOAA's National Centers for Environmental Information (NCEI) dataset to the calendar day that occurred on starting on June 1, 1981 in order to provide what was felt to be a more accurate indication of the day the extreme occurred on. It is possible in an isolated case the high may have not have occurred that way. However, it is felt such days are not represented in the extreme daily records. No adjustments at all were made for minimum

temperatures, thus each minimum was left assigned to the day it was reported on. However, there may be some cases on a very cold morning where the at observation temperature may wind up being the low for the next twenty-four hour period and thus reflected as the next day's minimum temperature. This procedure was used through November 1, 2015. Effective November 2, 2015 temperature records reflect calendar day in the GHCN-Daily dataset.

Temperature data for Death Valley were initially written on a monthly observation form. Initially this form was titled "Cooperative Observer's Meteorological Record". During the early 2000s the former National Climatic Data Center in Asheville, North Carolina digitized the cooperative weather records nationwide including those of Death Valley's. Data from 1948 onwards was assigned to a data set known as TD-3200 or Surface Land Daily Cooperative Summary of the Day while the data from 1911 through 1947 was assigned to TD-3206 known as Cooperative Summary Of The Day - CDMP (Pre 1948). While the datasets from 1948 onward did have quality control measures noted in them by the National Climatic Data Center, some of the earlier data before the 1940s did not undergo this. Therefore the author of this paper worked with the National Climatic Data Center staff to remove suspect temperature data. Many of these observations appear to be related to poor observing practices on the part of observers at the time (such as not resetting thermometers after taking an observation) or occasional faulty equipment. In some cases a broken thermometer accounted for a large chunk of missing maximum or minimum temperatures until the observer was able to be sent a new thermometer. Prior to the 1940s very little quality control was done on cooperative observer data. In addition, meteorologists at the time lacked the duration of observations in such an extreme region to perform a thorough assessment of the area's climate with respect to catching some outlying reports. The handwriting on older forms was in many cases illegible or hard to read due to the forms being pulled from microfilm. A number of erroneous temperatures were corrected through consulting the *Climatological Data* publication for values as well as restudying original forms available online from NOAA's National Centers for Environmental Information (NCEI)Image and Publications System. Lastly, a few months of data were found missing in the records of the National Climatic Data Center at the time but had hard copies of the observations on file at the Death Valley library in Cow Creek. The author, through correspondence with the National Park Service, was able to obtain copies of these forms and have them added into the official NOAA's National Centers for Environmental Information (NCEI) records.

During the mid-2000s, the National Weather Service instituted several changes to the cooperative weather observing program. Among the changes was to submit weather observations through a computer program known as WxCoder. This allowed observers to enter their observations in at a computer and then generated the monthly observation form in a typed format. This significantly reduces the risk of an observation being misread due to poor handwriting. In

2011, the official National Climatic Center datasets for Death Valley moved to a new dataset called GHCN-Daily or (Global Historical Climatology Network)-Daily.

It should be noted that as of the initial publication of this report, some suspect low temperature data was not removed from NOAA's National Centers for Environmental Information (NCEI) datasets as reviews by their staff were still underway. This included low temperatures on May 25 and 27 in 1922, May 1, 1925, from April 24 through the 28 of 1927, May 17, 1927, June 2, 1934 and from May 29 through June 1 of 1935. Low temperatures on these dates were considered suspect by the author based on small diurnal temperature ranges given relatively clear conditions as well as based on comparison checks with nearby cooperative weather stations.

The temperature dataset compiled locally then was used to generate additional temperature statistics listed in this publication as well. These included statistics on the number of days a certain temperature threshold was reached in a month, consecutive days of a certain temperature as well as average temperature.

Daily records of temperature in Death Valley started on June 8, 1911. All temperature data is given in degrees Fahrenheit. On overview of each month's temperatures is listed below, followed by normal and record extremes for each day and month. Normals are from 1981-2010 and provided by NOAA's National Centers for Environmental Information (NCEI).

Month	Normal Average Maximum Temperature	Normal Average Minimum Temperature	Normal Average Temperature
January	66.9	40.0	53.4
February	73.3	46.3	59.8
March	82.1	54.8	68.4
April	90.5	62.1	76.3
May	100.5	72.7	86.6
June	109.9	81.2	95.5
July	116.5	88.0	102.2
August	114.7	85.7	100.2
September	106.5	75.6	91.0
October	92.8	61.5	77.1
November	77.1	48.1	62.6
December	65.2	38.3	51.7
Annual	91.4	62.9	77.2
All normals are based on the period from 1981 – 2010.			

Month	Record Highest Maximum	Record Lowest Maximum	Record Highest Minimum	Record Lowest Minimum
January	87 on 1/25/2015*	38 on 1/21/1937	70 on 1/26/1934	15 on 1/8/1913
February	98 on 2/28/1986	44 on 2/9/1920	68 on 2/27/1963	21 on 2/13/1933
March	104 on 3/31/2015	55 on 3/12/1937	77 on 3/30/1978	26 on 3/4/1989
April	113 on 4/22/2012*	59 on 4/10/1927*	87 on 4/15/1947	35 on 4/6/1921
May	122 on 5/29/2000	60 on 5/5/1921	94 on 5/20/2008	42 on 5/7/1930*
June	129 on 6/30/2013	74 on 6/6/1925	102 on 6/16/1917	49 on 6/2/1923
July	134 on 7/10/1913	85 on 7/8/1918	110 on 7/5/1918	62 on 7/1/1927
August	127 on 8/2/1993*	80 on 8/18/1983	106 on 8/1/1920	65 on 8/27/1972*
September	123 on 9/1/1996	76 on 9/20/2005*	100 on 9/18/1927	41 on 9/22/1924
October	113 on 10/1/2012*	61 on 10/30/1920	85 on 10/8/1964*	32 on 10/13/1924*
November	97 on 11/1/1966*	45 on 11/27/1919	75 on 11/8/1913	24 on 11/27/1921
December	89 on 12/3/1949	38 on 12/23/1990	70 on 12/23/1914*	19 on 12/27/1924
Annual	134 on 7/10/1913	38 on 12/23/1990*	110 on 7/51918	15 on 1/8/1913
Daily records started on June 8, 1911. *Date listed above is most recent occurrence.				